

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of: Henderson et al.

Confirmation No: 7222

Serial No.: 10/588,630

Group Art Unit: 1651

Filed: August 4, 2006

Examiner: Tiffany Maureen Gough

For: Liquefaction Processes

**APPEAL BRIEF UNDER 37 C.F.R. 41.37**

Board of Patent Appeals and Interferences  
U.S. Patent and Trademark Office  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Applicants hereby appeal from the final rejection of claims 45-62, all the claims pending in the present application.

**I. REAL PARTY IN INTEREST**

The name of the real party in interest in this appeal is Novozymes North America, Inc.

**II. RELATED APPEALS AND INTERFERENCES**

There are no appeals or interferences relating to the instant application.

**III. SUMMARY OF CLAIMED SUBJECT MATTER**

The invention claimed in claim 45 is directed to a process for producing a liquefied material, comprising liquefying a starch-containing material with at least one alpha-amylase and a maltogenic amylase to form the liquefied material. See, e.g., page 1, lines 21-23 of the specification. As described at page 4 lines 30-23, liquefaction is a process in which a starch-containing material is broken down to dextrins.

In an embodiment claimed in claim 54, the size of the starch-containing material is reduced, e.g., by dry milling, prior to liquefaction. See, e.g., page 3, lines 21-22 of the specification. Following liquefaction, the liquefied starch-containing material is saccharified with a carbohydrate-source generating enzyme to produce low molecular weight sugars (page 7,

lines 14-15), which are then fermented by a fermenting microorganism to produce a fermentation product (page 8, lines 3-6).

#### **IV. ARGUMENT**

##### **I. The Rejection of Claims 45-62 under 35 U.S.C. 102(e)**

Claims 45-62 are rejected under 35 U.S.C. 102(e) as anticipated by Grichko (US 2004/0253696). The rejection is summarized in the Office Action mailed June 8, 2011 as follows:

Grichko teaches a process for liquefying starch-containing material comprising treating with at least one alpha-amylase and a maltogenic amylase which has been reduced in size by milling. Grichko also teaches the liquefaction process to be carried out as a multi-step process within the temperature ranges of 80-105°C then 65-95°C and finally between 40-75°C. The starch material is treated with an esterase such as lipase and phospholipase. The process is also carried out in the presence of a fatty acid oxidizing enzyme such as lipoxxygenase (0008,0009,0012,0022,0023,0025,0039-0063,0085-0098,0109-0112). They teach that a maltogenic amylase is used during any stage, for example liquefaction and/or saccharification. They also teach that liquefaction is commonly carried out with an alpha-amylase, thus adding the maltogenic amylase to the liquefaction step anticipates liquefying with at least one alpha-amylase and a maltogenic amylase.

Thus, the reference anticipates the claimed subject matter.

Applicants submit that Grichko fails to disclose each and every element of the claimed invention, and therefore the rejection should be reversed.

Grichko discloses a process for producing a fermentation product in a fermentation medium which comprises a fatty acid oxidizing enzyme. Grichko further discloses that the fermentation process may be used in combination with liquefaction and/or saccharification with additional enzymes. In paragraph [0046], Grichko discloses:

In a preferred embodiment of the invention one or more additional enzyme activities may be used in combination with ... the fatty acid oxidizing enzyme treatment of the present invention. Preferred additional enzymes are esterases, such as lipases and/or cutinases, phytase, laccase, proteases, cellulose [sic, cellulase], xylases [sic, xylanases], amylases, such as alpha-amylases, maltogenic alpha-amylases, beta-amylases, or glucoamylases, or mixtures thereof.

Applicants submit that the Office has misinterpreted this paragraph. One of ordinary skill in the art would interpret this paragraph to mean that one may use one or more enzymes of different genera, but does not suggest to use two enzymes of the same genus. This paragraph identifies the following genera: esterase, phytase, laccase, protease, cellulase, xylanase, and amylase.

Thus, this paragraph would suggest to use an esterase (e.g., a lipase or a cutinase) and a phytase, but not a lipase and a cutinase because lipase and cutinase are species of the same genus (i.e., esterase). Furthermore, this paragraph would suggest to use a cellulase and an amylase (e.g., an alpha-amylase, maltogenic alpha-amylase, beta-amylase or glucoamylase), but not an alpha-amylase and a maltogenic alpha-amylase.

This is further supported by paragraphs [0085] – [0094] of Grichko. In paragraph [0086], Grichko discloses that “the fatty acid oxidizing enzyme treatment is used in combination with an amylase, and in paragraph [0093], Grichko discloses that “The amylase may also be a maltogenic alpha-amylase.”

For the foregoing reasons, Applicants submit that the claims overcome this rejection under 35 U.S.C. 102, and request that the rejection be reversed.

## **II. The Rejection of Claims 45-48, 51, and 54-59 under 35 U.S.C. 102**

Claims 45-48, 51, and 54-59 are rejected under 35 U.S.C. 102(b) as anticipated by Veit et al. (WO 02/38787). The rejection is summarized in the Office Action mailed June 8, 2011 as follows:

Veit [et al.] teach a process for liquefying starch-containing material comprising treating with at least one alpha-amylase and a maltogenic amylase which has been reduced in size by milling. They also teach[] the liquefaction process to be carried out as a multi-step process within the temperature ranges of 80-105°C then 65-95°C and finally between 40-75°C (see Veit [35 al.] p.3-6,p.9,line 30-p. 14...). Veit [et al.] teach reducing starch material, liquefaction, saccharification and fermentation steps.

Thus, the reference anticipates the claimed subject matter.

Applicants submit that Veit et al. fail to disclose each and every element of the claimed invention, and therefore the rejection should be reversed.

Veit et al. disclose a process for producing ethanol comprising liquefaction of a starch-containing material in the presence of an alpha-amylase; jet cooking; and liquefaction. Veit et al. disclose at page 11, lines 19-21 that:

The invention relates to a method of producing ethanol by fermentation, said method comprising a secondary liquefaction step in the presence of a thermostable acid alpha-amylase or, a thermostable maltogenic acid alpha-amylase.

At page 1, lines 24-28, Veit et al. disclose:

Thus, the invention relates to a method of producing ethanol from a starch containing material, preferably based on whole grain, said method comprising the steps of: (a) liquefaction of a starch containing material in the presence of an alpha-amylase; (b) jet cooking; (c) liquefaction in the presence of a thermostable acid alpha-amylase or, or a thermostable maltogenic acid alpha-amylase; and (d) saccharification and fermentation to produce ethanol; wherein the steps (a), (b), (c) and (d) is performed in the order (a), (b), (c), (d).

Significantly, Veit et al. do not disclose the use of an alpha-amylase and a maltogenic alpha-amylase to liquefy a starch-containing material.

For the foregoing reasons, Applicants submit that the claims overcome this rejection under 35 U.S.C. 102, and request that the rejection be reversed.

#### **V. CLAIMS APPENDIX**

A copy of the claims involved in the appeal is provided in the Claims Appendix attached hereto.

#### **VI. CONCLUSION**

For the foregoing reasons, Applicants submit that claims ? are not rendered obvious by the cited references. Accordingly, the final rejection of the claims should be reversed.

Respectfully submitted,

Date: March 19, 2012

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**CLAIMS APPENDIX**  
**Copy of Claims Involved in the Appeal**

45. A process for producing a liquefied material, comprising liquefying a starch-containing material with at least one alpha-amylase and a maltogenic amylase to form the liquefied material.
46. The process of claim 45, further comprising reducing the starch-containing material in size prior to liquefaction.
47. The process of claim 46, wherein the starch-containing material is reduced in size by dry milling.
48. The process of claim 45, wherein the liquefaction is carried out in three stages, comprising a first stage at a temperature in the range from 80 to 105°C, a second stage at a temperature in the range between 65 to 95°C, and a third stage at a temperature between 40-75°C.
49. The process of claim 45, wherein the liquefaction is carried out in the presence of an esterase.
50. The process of claim 49, wherein the esterase is a lipase, phospholipase, or a cutinase, or a combination thereof.
51. The process of claim 45, wherein the starch-containing material is barley, corn, milo, or wheat.
52. The process of claim 45, wherein the maltogenic amylase is derived from *Bacillus*.
53. The process of claim 45, wherein the maltogenic amylase is derived from *Bacillus stearothermophilus*.

54. A process for producing a fermentation product, comprising
- (a) reducing the size of a starch-containing material;
  - (b) liquefying the product of step (a) by a process of claim 45 to form a liquefied material;
  - (c) saccharifying the liquefied material with a carbohydrate-source generating enzyme to form a saccharified material; and
  - (d) fermenting the saccharified material using a fermenting microorganism.
55. The process of claim 54, wherein steps (c) and (d) are carried out as a simultaneous saccharification and fermentation step.
56. The process of claim 54, wherein the carbohydrate-source generating enzyme is a glucoamylase.
57. The process of claim 54, further comprising distilling the fermented material.
58. The process of claim 54, wherein said fermenting microorganism is yeast.
59. The process of claim 54, wherein the fermentation product is ethanol.
60. The process of claim 54, wherein the liquefaction is carried out in the presence of an esterase.
61. The process of claim 60, wherein the esterase is a lipase, phospholipase, or a cutinase, or a combination thereof.
62. The process of claim 54, wherein the maltogenic amylase is derived from *Bacillus*.